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RADIUM MONITORING NETWORK

DATA RELEASE NUMBER 10

PUBLIC HEALTH SERVICE, DENVER, COLORADO

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DATA RELEASE NO. 10

U. S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
COLORADO RIVER BASIN WATER QUALITY CONTROL PROJECT
DENVER, COLORADO

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16. Abstracts
In this tenth data release report, radium-226 and uranium results are presented that supplement data from nine previous releases dated October 1962 through July 1966. The data indicate evidence of uranium mining and milling from analysis of composite water samples at stations of the Radium Monitoring Network of the Colorado River Basin Water Quality Control Project. The network is a surveillance system consisting of continuous surface water sampling at 27 locations throughout the basin. It assays the radiological content of river water over the entire basin. All of the data are in tabular form.

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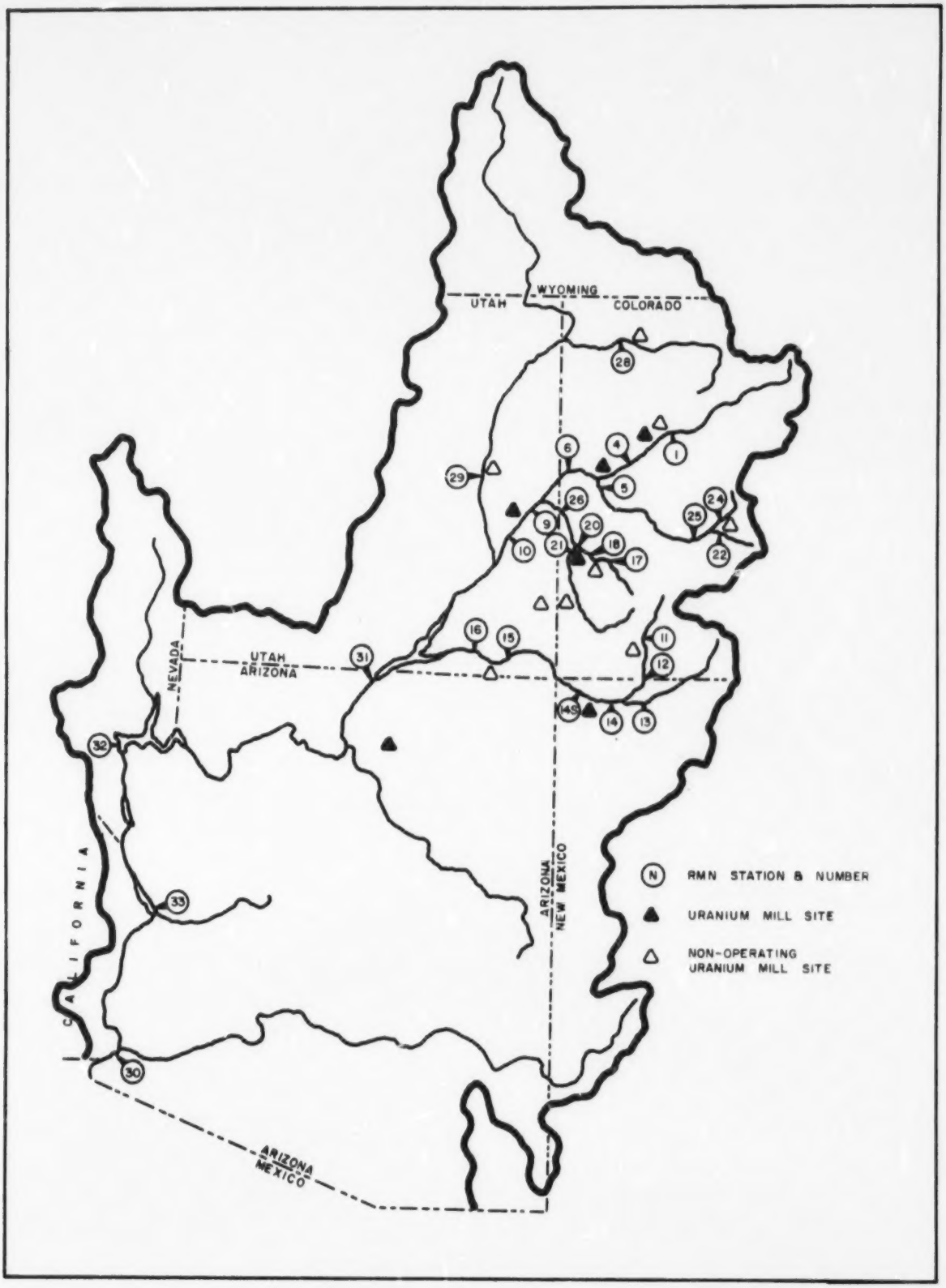

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COLORADO RIVER BASIN RADIUM MONITORING NETWORK

COLORADO RIVER BASIN WATER QUALITY CONTROL PROJECT

RADIUM MONITORING NETWORK DATA RELEASE NO. 10

INTRODUCTION

This is the tenth release of data collected through the Radium Monitoring Network, which is maintained by the Colorado River Basin Water Quality Control Project, Federal Water Pollution Control Administration. The purpose of this release is to supplement data given in the nine previous releases dated October 1962 through July 1966.

A summary report of Radium Monitoring Network data collected through December 1963 was published in the November 1964 edition of Radiological Health Data, copies of which are now available through Colorado River Basin Water Quality Control Project Headquarters. A similar report of data collected through December 1964 was published in the November 1965 edition of the same periodical and reprints are available through the U. S. Government Printing Office.

The Radium Monitoring Network is a surface water surveillance system consisting currently of twenty-one sampling stations located on various streams and reservoirs throughout the Colorado River Basin. During initial stages of the surveillance program, the system consisted of twenty-seven sampling stations. The purpose of the network is to provide continuous monitoring of radioactivity concentrations of Basin surface water so that the contribution from uranium mining and milling industry waste discharges can be determined. Samples are analyzed for radium-226, uranium, gross alpha, gross beta, thorium alpha, lead-210, and strontium-90 to provide a comprehensive picture of contributions of radiological contaminants to surface waters of the Colorado River Basin by the uranium industry and by fallout from the testing of weapons.

SAMPLING PROCEDURES

Depending on individual station parameters, Radium Monitoring Network (RMN) samples are collected as either automatic or grab samples. Grab samples are collected once or three times per week and automatic samplers collected 21-ml. portions every hour. The samples are sent as collected to the Colorado River Basin Water Quality Control Project Laboratory where they are composited and filtered through 0.45-micron membrane filters as soon as possible after the samples for the compositing period are received. After filtration, samples are acidified with 2% by volume of 12 N HCl and radiochemical determinations are then performed on the filtered water.

SIGNIFICANT FIGURES

In this release, a convention affecting the significant figures reported has been adopted. After a careful consideration of the accuracies and precisions involved in the various analytical procedures, it was decided to report data to two significant figures except in those instances where the lower limit of detection was being approached. In the latter instances, only one significant figure is reported. The last significant figure is an estimate.

In averages, three figures are retained if the precision and significance of the averaged data justify such retention. Thus, the overall averages for radium-226 at stations 11 and 26 are reported, respectively, as 0.05 and 1.09 picograms per liter.

RESULTS

The Appendix contains the dissolved radium-226 and uranium data collected since the ninth data release and a summary of all radium-226 and uranium data collected to date is given in Table 1. Gross alpha, gross beta, lead-210, thorium alpha, and strontium-90 data collected through June 1965 were reported in Data Releases Nos. 7 and 8; additional data on these parameters for the period July 1965 through June 1966 are presented in this release.

In general, radium-226 and uranium concentrations at all stations continue to average well below recommended maximum concentrations. Only one station, the Dolores River at Gateway, Colorado, continued to carry an overall average radium-226 concentration above one picogram per liter. All but three of the remaining stations continued to carry average concentrations little different from those found throughout the five-year monitoring period. The three stations, where significant change or variation has occurred, are located on the Animas River at the Colorado-New Mexico State Line, the San Miguel River below Uravan, Colorado, and Lake Mead at Hoover Dam.

The Animas River at the Colorado-New Mexico State Line produced lower average radium-226 concentrations for the monitoring period covered (April 1966 through September 1966) than for the overall period of monitoring; however, the average radium-226 concentrations (0.07 picogram per liter for the previous reporting period) increased to 0.12 picogram per liter for the current reporting period.

During the current reporting period, samples from the San Miguel River below Uravan, Colorado, averaged 1.48 picograms radium-226 per liter as compared with 0.47 picogram per liter during the previous period and an overall average of 0.89 picogram per liter during the entire

existence of the station. Most of the increase was observed in July, August, and September, 1966. During this period, the radium-226 concentration in one sample was 6.5 picograms per liter. The increases in radium-226 concentrations were accompanied by sharp increases in uranium concentrations. Increased concentrations of both radium-226 and uranium are attributable to waste discharges from the mill at Uravan, Colorado.

Radium-226 concentrations in the Dolores River at Gateway, Colorado, averaged 1.05 picograms per liter for the current reporting period. This figure is slightly lower than the overall average for the station and is 50% higher than the average for the previous reporting period. Sharp increases in radium-226 and uranium concentrations occurred in July, August, and September, 1966 and are attributable to waste discharges from the mill at Uravan, Colorado.

In Data Release No. 9, attention was called to an elevation in the average radium-226 concentration in Lake Mead as compared to the overall average. To confirm the increase and help determine the causes, special sampling and laboratory activities were carried on. Thirteen old samples from the Lake Mead station, including those from the previous reporting period, were reanalyzed for radium-226; the average result from the first analyses was 0.44 picogram radium-226 per liter as compared with an average result of 0.46 picogram per liter from the second analyses. For the nine samples included in the previous reporting period, the second analysis yielded an average radium-226 concentration which was higher than the reported value by 0.01 picogram per liter. It was concluded that the analytical work was not in serious error.

Twenty-three water samples were collected at various points and depths in Lake Mead and analyzed for radium-226. The sampling areas, number of samples, and average radium-226 concentrations in picograms per liter were: Boulder Basin (5), 0.44; Virgin Basin (5), 0.39; Temple Bar (4), 0.28; Gregg Basin (3), 0.22; Hoover Dam (5), 0.44; and Emery Falls (1), 0.24. While the differences in some of the averages are small, it was clear from the unreported individual samples that considerable variations in radium concentrations do exist in Lake Mead. The range of radium concentrations was 0.42 to 0.49 picogram per liter at both Hoover Dam and Boulder Basin. The radium monitoring network station is near Hoover Dam. The results of the samples corroborate the average radium-226 concentration reported in Data Release No. 9.

Eleven samples were collected on May 17-18, 1966, from Lake Mead, its tributaries, and the general vicinity for defining possible sources of radium-226. Radium-226 concentrations in these samples ranged from 0.04 to 0.44 picogram per liter; the lowest figure was

for Las Vegas Wash and the highest figure was for the Colorado River at Willow Beach. A sample from the Virgin River at Riverdale contained 0.38 picogram radium-226 per liter.

Leaching experiments on sediments from various locations in Lake Mead indicated that the leachability of radium-226 from sediments varied by a factor of twenty and depended qualitatively upon that part of the radium-226 content which was in excess of that found in "normal" sediment. Interestingly, the highest radium-226 and leachability were observed in a sample from Hoover Dam. The radium-226 leached from this sample was two to three times that leached from any other samples and ten to twenty times that leached from samples containing the "normal" amounts of radium-226.

The radium-226 concentration in Lake Mead for the current reporting period averaged 0.42 picogram per liter which is slightly lower than for the previous period but is higher than the long-time average and is nearly identical with the average concentration in Lake Havasu for the same period.

Results of radiochemical analyses of quarterly composites of samples from selected stations of the Radium Monitoring Network are given in Table 2. The composited samples were analyzed for gross alpha activity, gross beta activity, strontium-90, thorium (alpha-emitting), lead-210, and polonium-210. Most of the concentrations given for thorium, lead-210, and polonium-210 are near "background" levels or lower limits of detection and do not warrant comment. The thorium concentration of 1.2 picocuries per liter at station 1 appears out of line with results from other stations and with the gross alpha activity; however, it is not high enough to be of any concern. The strontium-90 concentrations vary with the quarter and station, but are well below accepted standards.

The alpha and beta activities above and below Moab, Utah, on the Colorado River and below Uravan, Colorado, on the San Miguel River tend to be noticeably higher than at most other stations; this is particularly true for the second and third quarter periods.

TABLE 1

RADIUM-226 AND URANIUM CONCENTRATIONS IN SURFACE WATERS OF THE COLORADO RIVER BASIN

Station Number and Location	Radium-226 Av.[a] pg/l	Radium-226 Range pg/l	Radium-226 No. of Analyses	Uranium Av.[a] µg/l	Uranium Range µg/l	Uranium No. of Analyses
Animas River						
11 above Durango, Colorado	0.05	0.00[b]-0.11	56	1.2	0.1-2.5	50
12 Colorado-New Mexico State Line	0.26	0.03[b]-1.5	108	3.4	0.0-18	65
Colorado River						
1 at Silt, Colorado	0.19	0.04-0.39	62	3.3	0.0-4.4	48
4 at DeBeque, Colorado	0.19	0.05-0.44	63	3.4	0.4-7.2	48
6 at Fruita, Colorado	0.18	0.09-0.40	57	8.5	2.0-14	48
9 above Moab, Utah	0.26	0.10-0.50	90	9.7	2.4-31[b]	77
10 below Moab, Utah	0.40	0.16-7.2	86	11	3.0-22	73
31 at Page, Arizona	0.21	0.05[b]-0.36[b]	39	7.1	2.8-13	39
32 Lake Mead	0.37	0.21-0.60	43	8.5	5.6-11	43
33 Lake Havasu	0.37	0.26[b]-0.44	45	8.2	5.7-11	45
30 at Yuma, Arizona	0.17	0.06-0.33	53	8.2	4.9-11	48
Dolores River						
21 at Bedrock, Colorado	0.44	0.03-1.4	60	10	0.1-35	47
26 at Gateway, Colorado	1.09	0.04-3.3[b]	100	13	0.1-51	77
Green River						
28 below Maybell, Colorado	0.09	0.03-0.15	36	2.7	0.6-8.0	32
29 below Green River, Utah	0.09	0.05-0.15	29	5.0	1.6-7.6	26

TABLE 1(Contd)

RADIUM-226 AND URANIUM CONCENTRATIONS IN SURFACE WATERS OF THE COLORADO RIVER BASIN

Station Number and Location	Radium-226 Av.[a] pg/l	Radium-226 Range pg/l	Radium-226 No. of Analyses	Uranium Av.[a] µg/l	Uranium Range µg/l	Uranium No. of Analyses
Gunnison River						
24 above Gunnison, Colorado	0.04	0.01-0.08	43	1.2	0.0-2.6	33
25 below Gunnison, Colorado	0.04	0.01-0.09	46	2.3	0.4[b]-4.3	33
5 at Grand Junction, Colorado	0.09	0.01-0.30	54	10	0.7-19	47
San Juan River						
13 above Farmington, N. M.	0.07	0.03-0.16	20	2.8	0.0-8.3	19
14 below Farmington, N. M.	0.08	0.03-0.21	48	2.8	0.3-9.0	47
14S below Shiprock, N. M.	0.08	0.03-0.28[b]	163	9.1	0.1-93	159
15 above Mexican Hat, Utah	0.12	0.04-0.66	56	6.4	1.4-23	43
16 below Mexican Hat, Utah	0.13	0.01-0.84	134	8.9	0.8-35	116
San Miguel River						
17 above Naturita, Colorado	0.04	0.00-0.14[b]	76	1.8	0.0-6.5	48
18 above Uravan, Colorado	0.22	0.03[b]-1.2	109	6.1	0.8[b]-63	78
20 below Uravan, Colorado	0.89	0.06-6.5	236	25	0.0-150	208

a Average concentration obtained from all data presented in this and previous data releases.

b This figure corrects an error which has appeared in previous releases.

TABLE 2

RADIOCHEMICAL ANALYSIS OF QUARTERLY COMPOSITE RMN WATER SAMPLES

Station Number and Location	Quarter Period[1/]	Gross α pc/l	Gross β pc/l	Sr-90 pc/l	Th (α) pc/l	Pb-210 pc/l	Po-210 pc/l	Date of Po-210 Determination
RMN 1								
Colorado River at Silt, Colorado	1	1.2	6.2	n.d.	1.2	0.1	0.04	2/8/66
RMN 4								
Colorado River at DeBeque, Colorado	1	2.9	7.0	1.2	n.d.	n.d.	n.d.	--
	2	5.3	9.1	0.7	n.d.	n.d.	n.d.	--
	3	3.7	8.2	0.8	n.d.	n.d.	n.d.	--
	4	3.3	4.5	0.6	n.d.	n.d.	n.d.	--
RMN 6								
Colorado River below Grand Junction, Colorado	1	7.2	6.3	n.d.	0.2	0.3	0.04	2/8/66
RMN 9								
Colorado River above Moab, Utah	1	3.9	12	3.2	n.d.	n.d.	n.d.	--
	2	10	13	1.0	n.d.	n.d.	n.d.	--
	3	11	15	1.1	n.d.	n.d.	n.d.	--
	4	6.7	7.0	0.9	n.d.	n.d.	n.d.	--
RMN 10								
Colorado River below Moab, Utah	1	5.0	13	n.d.	0.5	0.0	0.05	2/8/66
	2	12	13	n.d.	0.0	0.1	0.12	10/10/66
	3	12	12	n.d.	0.0	0.3	0.05	10/10/66
	4	7.6	9.1	n.d.	0.0	0.3	0.09	10/11/66

TABLE 2(Contd)

RADIOCHEMICAL ANALYSIS OF QUARTERLY COMPOSITE RMN WATER SAMPLES

Station Number and Location	Quarter Period[1/]	Gross α pc/l	Gross β pc/l	Sr-90 pc/l	Th (α) pc/l	Pb-210 pc/l	Po-210 pc/l	Date of Po-210 Determination
RMN 11								
Animas River above Durango, Colorado	1	0.6	3.7	0.7	n.d.	n.d.	n.d.	--
RMN 14S								
San Juan River below Shiprock, New Mexico	1	2.5	9.0	n.d.	0.0	0.2	0.00	2/8/66
RMN 15								
San Juan River above Mexican Hat, Utah	2	3.8	7.8	1.4	n.d.	n.d.	n.d.	--
	3	3.4	6.8	1.2	n.d.	n.d.	n.d.	--
	4	2.6	5.0	0.9	n.d.	n.d.	n.d.	--
RMN 16								
San Juan River below Mexican Hat, Utah	2	3.2	7.3	n.d.	0.0	0.2	0.01	10/10/66
	3	4.4	7.2	n.d.	0.0	0.1	0.00	10/10/66
	4	3.3	5.1	n.d.	0.0	0.2	0.14	10/11/66
RMN 17								
San Miguel River above Naturita, Colorado	1	1.3	5.4	n.d.	0.6	0.0	0.01	2/8/66
RMN 18								
San Miguel River above Uravan, Colorado	1	2.7	8.6	n.d.	0.0	0.1	0.01	2/8/66

TABLE 2(Contd)

RADIOCHEMICAL ANALYSIS OF QUAPTERLY COMPOSITE RMN WATER SAMPLES

Station Number and Location	Quarter Period[1/]	Gross α pc/l	Gross β pc/l	Sr-90 pc/l	Th (α) pc/l	Pb-210 pc/l	Po-210 pc/l	Date of Po-210 Determination
RMN 20								
San Miguel River	1	5.1	11	n.d.	0.1	0.1	0.11	2/8/66
below Uravan, Colorado	2	17	12	n.d.	0.1	0.2	0.21	10/10/66
	3	20	14	n.d.	0.2	0.3	0.00	10/11/66
	4	5.5	5.9	n.d.	0.4	0.1	0.01	10/11/66
RMN 30								
Colorado River at U.S.-Mexico Border	1	4.6	13	1.6	n.d.	n.d.	n.d.	--
RMN 32								
Colorado River at Lake Havasu	1	5.9	12	2.0	n.d.	n.d.	n.d.	--

1/ Quarter Period
1 July 1965-September 1965
2 October 1965-December 1965
3 January 1966-March 1966
4 April 1966-June 1966

A P P E N D I X

Results of Radium-226 and Uranium Analyses of Samples
from Individual Radium Monitoring Network Stations
for Current Reporting Period

RMN Station 1: Colorado River at Silt, Colorado
Started: November 25, 1961
Type: Automatic Pump-Timer

Date	Radium-226 pg/liter	Uranium µg/liter
1966		
April 30-May 27	0.08	0.7
May 27-July 2	0.11	1.2
July 2-July 30	0.18	2.3
July 30-August 26	0.24	2.6
September 3-October 1	0.22	2.7

RMN Station 4: Colorado River above DeBeque, Colorado
Started: November 12, 1961
Type: Automatic Pump-Timer

Date	Radium-226 pg/liter	Uranium µg/liter
1966		
April 30-May 27	0.09	0.7
May 27-July 2	0.12	2.0
July 1-July 30	0.16	4.0
July 30-September 3	0.20	3.4
September 3-October 1	0.22	2.6

RMN Station 5: Gunnison River above Grand Junction, Colorado
Started: April 16, 1962
Type: Three grab samples per week

Date	Radium-226 pg/liter	Uranium µg/liter
1966		
May 2-May 27	0.06	5.3
May 30-July 1	0.10	7.6
July 4-July 29	0.10	12
August 1-September 12	0.19	14

RMN Station 6: Colorado River near Fruita, Colorado
Started: April 16, 1962
Type: Three grab samples per week

Date	Radium-226 pg/liter	Uranium µg/liter
1966		
May 2-May 27	0.12	3.9
May 30-July 1	0.15	5.0
July 4-July 29	0.20	7.4
August 1-September 2	0.19	9.8
September 5-September 30	0.16	11

RMN Station 9: Colorado River above Moab, Utah
Started: December 11, 1961
Type: Three grab samples per week

Date	Radium-226 pg/liter	Uranium µg/liter
1966		
May 2-May 27	0.19	2.4
May 30-July 1	0.22	5.1
July 4-July 29	0.34	11
August 1-September 2	0.38	13

RMN Station 10: Colorado River below Moab, Utah
Started: December 11, 1961
Type: Three grab samples per week

Date	Radium-226 pg/liter	Uranium µg/liter
1966		
May 2-May 27	0.18	3.1
May 30-July 1	0.20	4.8
July 4-July 29	0.30	12
August 1-September 2	0.65	13

RMN Station 11: Animas River at Durango, Colorado
Started: July 17, 1961
Type: One grab sample per week

Date	Radium-226 pg/liter	Uranium µg/liter
1966		
May 6-May 27	0.03	0.6
June 3-July 1	0.05	1.3
July 1966	0.05	0.3
August 5-September 2	0.08	1.4

RMN Station 12: Animas River at Colorado-New Mexico State Line
Started: January 19, 1961
Type: Three grab samples per week

Date	Radium-226 pg/liter	Uranium µg/liter
1966		
May 2-May 27	0.08	0.8
May 29-June 29	0.08	0.9
July 1-July 28	0.11	1.4
July 30-September 1	0.19	3.3

RMN Station 14: San Juan River at Fruitland, New Mexico
Started: August 1, 1962
Type: One grab sample per week

Date	Radium-226 pg/liter	Uranium µg/liter
1966		
May 2-May 23	0.05	1.3
May 30-June 27	0.06	0.8
July 4-July 25	0.09	2.8
August 1-August 29	0.05	3.0

RMN Station 14S: San Juan River below Shiprock, New Mexico
Started: August 7, 1962
Type: One grab sample per week

Date	Radium-226 pg/liter	Uranium µg/liter
1966		
May 2	0.03	1.4
May 9	0.08	0.6
May 16	0.06	1.3
May 23	0.06	1.1
May 31	0.05	1.5
June 6	0.06	1.4
June 14	0.08	2.2
June 20	0.05	2.1
June 27	0.08	2.4
July 11-July 25	0.06	3.5

RMN Station 15: San Juan River above Mexican Hat, Utah
Started: December 11, 1961
Type: Three grab samples per week

Date	Radium-226 pg/liter	Uranium µg/liter
1966		
April 30-May 27	0.04	1.4
May 29-June 30	0.06	2.7
July 2-July 29	0.11	5.0
July 31-September 2	0.11	5.7
September 4-September 29	0.10	6.7

RMN Station 16: San Juan River below Mexican Hat, Utah
Started: December 11, 1961
Type : Three grab samples per week

Date	Radium-226 pg/liter	Uranium µg/liter
1966		
April 30-May 27	0.04	1.5
May 29-June 30	0.05	3.3
July 2-July 29	0.09	5.0
July 31-September 2	0.14	6.5
September 4-September 29	0.09	5.1

RMN Station 17: San Miguel River above Naturita, Colorado
Started: October 28, 1961
Type: One grab sample per week

Date	Radium-226 pg/liter	Uranium µg/liter
1966		
May 2-May 23	0.04	0.4
May 30-June 27	0.06	1.0
July 5-July 23	0.05	2.7
July 31-August 29	0.06	5.1
September 5-September 26	0.08	6.5

RMN Station 18: San Miguel River above Uravan, Colorado
Started: October 27, 1961
Type: Automatic Pump-Timer

Date	Radium-226 pg/liter	Uranium µg/liter
1966		
May 2-May 30	0.14	1.0
May 30-July 5	0.10	2.2
July 5-July 31	0.18	3.6
July 31-September 5	0.20	6.0
September 5-October 3	0.15	5.7

RMN Station 20: San Miguel River below Uravan, Colorado
Started: October 9, 1961
Type: Automatic Pump-Timer

Date	Radium-226 pg/liter	Uranium µg/liter
1966		
May 2-May 9	0.21	0.8
May 9-May 16	0.32	2.2
May 16-May 24	0.22	0.8
May 24-May 30	0.86	1.7
May 30-June 6	*	*
June 6-June 13	0.31	3.7
June 13-June 20	0.26	5.4
June 20-June 27	0.80	8.4
June 27-July 5	0.84	9.4
July 5-July 11	2.4	18
July 11-July 18	1.9	16
July 18-July 25	0.96	24
July 25-July 31	0.70	27
July 31-August 8	0.32	19
August 8-August 15	0.98	33
August 15-August 22	0.36	46
August 22-August 29	2.50	76
August 29-September 5	2.60	42
September 5-September 12	1.6	29
September 12-September 19	2.8	51
September 19-September 26	3.7	66
September 26-October 3	6.5	77

* Sample bottle broken.

RMN Station 21: Dolores River at Bedrock, Colorado
Started: October 30, 1961
Type: Three grab samples per week

Date	Radium-226 pg/liter	Uranium µg/liter
1966		
April 4-April 29	0.11	1.8
May 2-May 27	0.08	0.1
May 30-July 1	0.21	3.5
July 5-July 29	0.78	12
August 1-September 2	0.49	8.6

RMN Station 26: Dolores River at Gateway, Colorado
Started: October 30, 1961
Type: Three grab samples per week

Date	Radium-226 pg/liter	Uranium µg/liter
1966		
April 4-April 30	0.34	6.3
May 2-May 27	0.36	5.9
May 31-July 1	0.78	8.0
July 5-July 29	1.8	20
August 1-September 3	1.1	31
September 5-September 30	1.9	43

RMN Station 30: Colorado River at U.S.-Mexican Border
Started: July 30, 1962
Type: One grab sample per week

Date	Radium-226 pg/liter	Uranium µg/liter
1966		
May 2-May 27	0.12	9.5
May 31-July 1	0.18	7.0
July 5-July 29	0.22	9.2
August 1-September 2	0.22	7.4
September 6-September 30	0.20	6.7

RMN Station 31: Colorado River at Page, Arizona
Started: May 1, 1963
Type: 300-ml. composite per week

Date	Radium-226 pg/liter	Uranium µg/liter
1966		
April 4-April 25	0.19	5.8
May 2-May 16	0.18	3.7
June 1966	0.12	4.8
July 1966	0.12	3.9

RMN Station 32: Colorado River at (Lake Mead) Boulder City, Nevada
Started: March 11, 1963
Type: One grab sample per week

Date	Radium-226 pg/liter	Uranium µg/liter
1966		
May 2-May 23	0.44	8.9
May 31-June 27	0.45	6.0
July 5-July 25	0.39	7.5
August 1-August 29	0.41	7.0
September 6-September 26	0.41	7.3

RMN Station 33: Colorado River at Metropolitan Water District Intake, Lake Havasu, California-Arizona
Started: January 7, 1963
Type: One grab sample per week

Date	Radium-226 pg/liter	Uranium µg/liter
1966		
May 2-May 23	0.41	7.7
May 30-June 27	0.41	7.1
July 4-July 25	0.44	8.0
August 1-August 29	0.40	8.1
September 5-September 26	0.39	6.8